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A Systematised Literature Review investigating the effects of Oscillating Positive Expiratory Pressure (OPEP) therapy on clinical outcomes in patients with Chronic Obstructive Pulmonary Disease (COPD)

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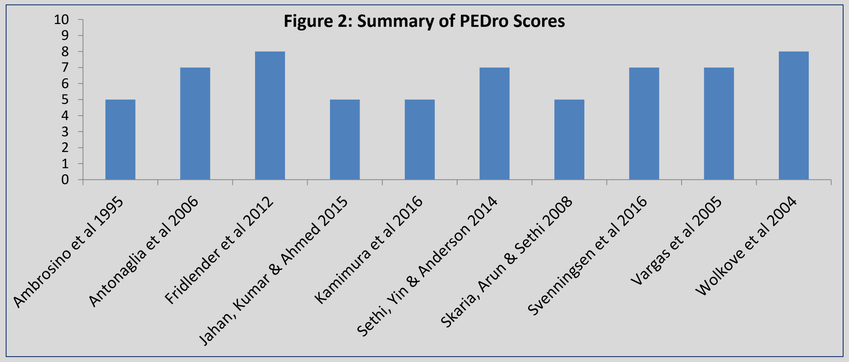
Background

The progressive airflow obstruction and frequent exacerbations characteristic of COPD accounts for 1.4 million GP consultations annually and costs the NHS over £800 million annually for emergency hospital admissions (Greener, 2011; NHS Medical Directorate, 2012). OPEP is an airway clearance technique which produces high frequency short bursts of increased expiratory airflow to create shearing forces which reduce secretion viscosity and cause the airways to vibrate, aiding secretion mobilisation from the peripheral to the central airways (Lee et al., 2015; Barker, Laverty and Hopkinson, 2017). The use of OPEP to optimise mucociliary clearance and remove excess secretions from the airways may reduce the economic burden of COPD on NHS resources. Therefore, this study aimed to evaluate the effect of intrathoracic OPEP on clinical outcomes in stable and acute exacerbations of COPD.

Methods

A comprehensive search was undertaken (Figure 2). Inclusion criteria included an experimental study design of randomised controlled trials or randomised crossover studies, which investigated the effects of intrathoracic OPEP compared to control or other ACTs in adults with COPD, Chronic Bronchitis or Emphysema which were written in the English language. Studies which evaluated OPEP as a single treatment and studies which investigated extra thoracic oscillation devices were excluded.

Figure 2: Summary of PEDro Scores



References: Barker, R., Laverty, A. A. and Hopkinson, N. S. (2017) 'Adjuncts for sputum clearance in COPD: Clinical consensus versus actual use', *BMJ Open Respiratory Research*, 4(1), pp. 1–5. Greener, M. (2011) 'Easing the burden of COPD: NICE guidelines and new agents.', *Nurse Prescribing*, 9(2), pp. 64–67. Lee, A. L. et al. (2015) 'The effects of oscillating positive expiratory pressure therapy in adults with stable non-cystic fibrosis bronchiectasis: A systematic review', *Chronic Respiratory Disease*, 12(1), pp. 36–46. NHS Medical Directorate (2012) 'COPD Commissioning Toolkit: A Resource for Commissioners', *COPD Commissioning Toolkit*, pp. 1–13. [online] available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212876/chronic-obstructive-pulmonary-disease-COPD-commissioning-toolkit.pdf.

Figure 1: Flow Diagram Search Strategy Undertaken

Search Terms

Chronic Obstructive Pulmonary OR Disease OR COPD OR Chronic Obstructive Airway Disease OR COAD OR Chronic Bronchitis OR Emphysema

AND

Oscillating Positive Expiratory Pressure OR Flutter OR Acapella OR Cornet OR Quake OR Intrapulmonary Percussive Ventilation OR Intrapulmonary percussive ventilator OR VibraLung OR MetaNeb, OR Oscillatory Positive Expiratory Pressure OR OPEP OR O-PEP OR Iterobika OR Lung Flute OR Aerobika

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230 Records identified from Database Searching of MEDLINE, Academic Search Complete, CINAHL complete, psychINFO, SPORTdiscus, TRIP, ProQuest Central, and PubMed

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37 Records included after screening of title and abstract
193 Records excluded
- 67 did not investigate COPD
- 75 did not investigate OPEP as an intervention
- 36 Study design did not meet inclusion criteria
- 5 duplicates within the same database
- 4 ongoing trials
- 6 were poster abstracts with no full publication

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14 Records after duplicates removed

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4 New records identified through citation tracking on google scholar (n = 3) and through hand search of reference lists (n = 1)

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18 Records assessed for eligibility

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11 Records Critically Appraised Using PEDro score (Figure 2)
- 1 study excluded with PEDro score of 2

7 Records excluded
- Inappropriate Study Design (3)
- Evaluated OPEP as a single treatment (4)

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10 Records included in synthesis

Results

A total of 322 participants from 10 studies were included. Mean PEDro score was 6.4 (+/- 1.3) and the range was 5-8. Only two of the included studies investigated AECOPD. Treatment duration ranged from 10-30 minutes per session, repeated one to four times daily, for two days to 26 weeks. OPEP was compared to other ACTs in five studies, usual care in three studies and to a sham device in two studies.

Stable COPD

HRQL
OPEP did not improve disease specific HRQOL total scores

Exacerbation Rate
OPEP did not improve exacerbation rate

Sputum Volume
OPEP was equally as effective as other ACTS in improving volume of sputum expectorated

Gas Exchange
OPEP was equally as effective in improving Sp02 as other ACTs

Exercise Tolerance
OPEP significantly ($p<0.05$) increased 6MWT compared to a sham device and usual care and significantly improved ($p<0.05$) exertional breathlessness compared to sham and autogenic drainage.

Lung Function
OPEP resulted in significant improvement in FVC compared to sham and significantly ($p=0.000$) slowed deterioration in FEV1 when compared to usual care.
OPEP was equally effective in improving PEFR as other ACTS

Exacerbation of COPD

Gas Exchange
OPEP significantly improved ABGs ($p<0.01$) compared to usual care and usual care plus physiotherapy

Use of NIV
OPEP significantly ($p<0.05$) reduced the requirement and duration of NIV treatment compared to usual care

Hospital Length of Stay
OPEP significantly ($p<0.05$) reduced hospital length of stay compared to usual care

Conclusions

In stable COPD, OPEP is associated with an improvement in exercise capacity and lung function. In acute exacerbation of COPD, use of OPEP reduced the requirement and duration of NIV treatment and reduced hospital length of stay.

Implications

Practice	• Physiotherapists should continue to prescribe ACTs based on the assessment findings of each individual and their individual problems. Use of OPEP should be considered in AECOPD.
Research	• A systematic review with meta-analysis is recommended conducted by experts such as the Cochrane Collaboration, in order to inform evidence-based practice and future policy. • High-quality RCTs are required to investigate the effect of OPEP on exercise capacity as part of a pulmonary rehabilitation programme and to investigate the effect of OPEP in AECOPD managed in primary care
Policy	• It is not recommended policy should change following this study, as the research question has not been conclusively answered as methodological quality of studies was limited, introducing the risk of bias and inflated treatment effects.